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The hypothesis that tests of precollege aptitude/achievement are poor predictors of later college grades because of uneven changes in aptitude development over these years was investigated. A battery of 11 tests administered before college entrance was readministered to 59 female and 67 male college seniors. Correlations obtained from high school and college grade point averages were compared with residual change scores (representing the difference between the college senior score and that predicted from the high school senior score). Contrary to expectation, college senior correlations showed the same pattern as found with high school tests: reasonable validities for the first 3 years and no correlations in the senior year. Although this sample developed intellectually in college, aptitude change appeared relatively uniform throughout the sample. The unreliability of senior grades which are based on disparate course selection was offered as an explanation of fourth year unpredictability. (Author/JS)

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Relations between Aptitude Changes and Academic Success during College

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Tested was the hypothesis that precollege aptitude/achievement measures are poor predictors of later college grades because of uneven changes in aptitude maturation over these years. A precollege battery of 11 tests was readministered 59 female and 67 male college seniors. Compared were correlations with the 12 quarterly GPA's for high school tests, college senior tests, and residual change scores. Contrary to expectation, college senior correlations showed the same pattern as found with high school tests: reasonable validities for the first three years and zero correlations in the senior year. Although this sample matured intellectually in college, aptitude change appeared relatively uniform across individuals. Unreliability of senior grades based on disparate course selection was offered to explain fourth year unpredictability.

Humphreys (1968) has recently documented the fact that although precollege aptitude measures have appreciable validity with freshman grades, a startling degree of shrinkage occurs in predicting grades for subsequent semesters of college. He interpreted this finding as documenting the need for changing admission and retention policies. He argued, for example, that college grades were so unstable that students dropped on the basis of early performance might do acceptable work later on. He felt this instability of grades in turn might rest on differential rates of aptitude maturation over the college years and suggested that retest data in the college senior year could test the hypothesis that the low correlation between a precollege test and senior grades was due to a shift in the rank ordering of individuals on

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that tested aptitude. If this were so, aptitudes measured in the senior year ought to correlate as highly with senior grades as freshman aptitudes do with freshman grades.

During spring 1967 senior volunteers (59 women and 67 men) at the University of Washington were paid to retake the same battery of precollege aptitude/achievement measures administered four years earlier. This sample which had made normal progress over four years of college was significantly superior to the freshman class in which it entered. Significant intellectual growth occurred on all tests with equal rates of maturation in each aptitude for the sexes (Lunneborg, in press). However, when intellectual change was treated as deviation from predicted growth (a residual change score representing the difference between the college senior score and the one predicted from the high school senior score) it was found that the sexes differed in the manner and extent to which the college environment had been effective (Lunneborg and Lunneborg, 1968). Male deviations from expected growth were more often correlated with various course criteria and survey items of background and educational orientation. Female deviations, on the other hand, were essentially uncorrelated with these educational criteria while being highly intercorrelated, e.g., females who matured more verbally than predicted also matured more quantitatively than predicted.

The retest data for this sample allow a test of Humphreys' question regarding the nature of aptitude maturation during college (all references will be to his 1968 report). Had in his study precollege test scores correlated as highly with later GPA's as with early GPA's, then whatever maturation occurred would have been uniform for all Ss. The notion of the late bloomer

would never have arisen. But given that precollege test scores are not highly related to later college GPA's, if college senior test performance were found to correlate highly with later college GPA's (and less well with early GPA's), then it could be assumed that aptitude maturation had occurred at different rates in different individuals. It would also mean that such tests were always valid "predictors" of college performance if administered at the same time. A similar maturation hypothesis can also be tested with this sample by correlating residual change scores with quarterly GPA's. If aptitude maturation proceeds unevenly, as Humphreys speculated, then those Ss who matured the most (have college senior test scores higher than predicted from high school performance) should tend to get better grades as seniors than those who matured less during this period. Residual scores and quarterly GPA's should correlate more highly as later quarters are considered. In spite of not knowing when the gain was achieved, it will have been achieved by more and more people as time passes. All of these hypothetical situations presume that all quarterly GPA's are equivalent in relation to the aptitudes measured.

Method

For the sample described above GPA's were computed for each of the 12 quarters constituting the four academic years following entrance. N for any quarter never dropped below 119, but Ss' missing a quarter or graduating early meant not all of these GPA's were based on 126 cases. In addition to intercorrelating the quarterly GPA's, they were correlated with high school grades and with three scores for each of 11 precollege tests: high school score, college senior score, and residual score as defined earlier.

Unlike Humphreys' sample no attempt was made to weight correlations for different colleges and sexes because of sample size. College majors were among women: humanities 42%, social science 34%, natural science 22%, and business 2% (N = 1). Majors among men were: engineering 28%, natural science 25%, social science 22%, humanities 14%, and business 11%.

Results

Table 1 compares with Humphreys' results using high school rank as a predictor of college grades. The subject areas of social studies and electives were consistently poor predictors, however, English, foreign language, mathematics, and natural science grades showed the same pattern as Humphreys' rank which dropped gradually from .39 to .22 from the first to the last semester. The table also shows both the high level of achievement obtained by this group in high school and the steady increase in their grades during college. Note that the standard deviations for the quarterly college criteria display little more variability than the SD's reported for Humphreys' 1600 students. And despite higher GPA's over time, the constancy of these standard deviations means, as it did in Humphreys' study, that the shrinkage in validities is not due to any attenuation in the range of the criteria.

Consistent with Humphreys' findings with ACT tests given prior to college entrance, the tests administered here in high school all had useful validities ranging from .18 for spatial ability to .43 for data sufficiency against first quarter grades as may be seen in Table 2. Although all high school tests had appreciably reduced correlations with senior year grades, quarters 10, 11, and 12, a careful examination of Table 2 suggests that for only two tests, English usage and spelling, was there a consistent reduction

in validity over the first three years. For all other high school measures the drop was instead a dramatic one between the junior and senior year. Thus, t the ACT test data reported by Humphreys are more similar to present high school grade data than to present test data, i.e., both ACT and high school GPA's exhibited a steady decrease in validity over four years.

Table 2 also reveals that the correlations of tests administered this sample as college seniors remarkably paralleled the above patterns for high school tests. While college senior test correlations tended to be lower than high school validities, they were again highest for the first three college years with the senior quarter correlations dropping to near zero values. Equally disappointing were the results of correlating residual change scores with quarterly grades. Both of these negative findings can be largely explained by the last item in Table 2, the four-year stability coefficients, r_{12}. These coefficients were remarkably high suggesting that college senior test performance is more determined by high school test performance than by maturation during college. The residual change scores were, therefore, necessarily unreliable and could not be expected to show strong correlations with any criteria. One residual change score was associated significantly with quarterly grades--spatial ability which as deviation from predicted change was even more highly correlated than high school spatial ability scores.

Examination of the quarterly GPA intercorrelations displayed the same pattern of diminishing r's the further separated the two quarters as reported by Humphreys. Adjacent quarter correlations revealed an interesting pattern over the four years. The correlations were, for the first year, .60 and .62;

Table 1

Correlations of High School Grades with Quarterly College Grades

(Decimal points omitted)

High school grades	Quarterly college GPA's													
	1	2	3	4	5	6	7	8	9	10	11	12	$\bar{X}$	SD
English	23	30	27	17	20	14	12	06	07	-09	08	08	3.34	.48
Foreign language	34	32	32	26	18	19	22	21	18	08	11	11	3.20	.65
Mathematics	44	44	40	43	46	50	35	38	37	22	17	22	3.22	.62
Natural science	41	40	34	28	32	40	22	18	26	00	15	11	3.33	.55
Social studies	11	21	17	19	18	22	14	11	14	07	20	14	3.42	.51
Electives	13	22	11	09	07	04	04	00	00	-01	02	14	3.44	.48
$\bar{X}$	2.75	2.71	2.74	2.76	2.78	2.89	2.94	2.95	2.90	3.07	3.09	3.12		
SD	.60	.54	.60	.63	.61	.54	.57	.56	.62	.64	.64	.61		

Note.--For N = 126, r = .18 and .23 for .025 and .005 points of significance respectively.

Table 2

Correlations of Quarterly College Grades with High School and College Senior Tests and Residual Change Scores

(Decimal points omitted)

Test scores	Quarterly college GPA's												r_{12}
	1	2	3	4	5	6	7	8	9	10	11	12	
English usage													
High school	34	32	25	26	35	30	26	28	20	03	08	13	
College senior	34	30	25	20	33	19	24	30	22	05	03	15	74
Residual	13	10	08	01	09	-06	07	13	10	04	-05	09	
Spelling													
High school	25	14	11	23	24	19	11	10	07	06	01	02	
College senior	14	10	11	19	22	14	22	15	12	01	00	07	69
Residual	-06	00	05	04	08	01	22	11	10	-04	02	08	
Vocabulary													
High school	28	22	16	22	29	25	21	23	25	04	08	10	
College senior	23	22	14	12	24	13	27	23	24	-02	00	07	73
Residual	07	09	06	-05	04	-05	18	11	11	-08	-08	01	
Reading comp													
High school	20	20	23	21	27	32	23	20	29	13	15	19	
College senior	24	17	22	24	27	33	25	21	24	09	02	11	58
Residual	15	06	11	15	14	19	15	12	10	01	-08	00	

Table 2 (continued)

Test scores	Quarterly college GPA's												$r_{\cdot 12}$
	1	2	3	4	5	6	7	8	9	10	11	12	
Data sufficiency													
High school	43	39	31	39	44	42	37	36	41	11	19	21	
College senior	29	35	28	20	27	29	30	31	19	02	-04	11	54
Residual	07	15	12	-02	03	07	12	13	-04	-05	-18	00	
Quant judgment													
High school	42	39	31	40	42	40	35	35	37	10	16	18	
College senior	27	26	25	32	29	31	33	34	35	07	12	16	74
Residual	-07	-04	03	04	-04	02	10	11	12	-01	00	05	
Functional rela													
High school	37	33	27	36	41	41	35	32	35	11	16	18	
College senior	22	26	23	28	38	38	26	22	26	18	08	10	59
Residual	-02	08	07	07	17	15	07	01	06	15	-03	-02	
Applied math													
High school	28	23	18	33	34	30	29	28	28	13	21	09	
College senior	28	21	19	28	25	32	34	32	34	09	12	18	68
Residual	12	07	09	08	02	16	19	17	21	00	-02	17	

Table 2 (continued)

Test scores	Quarterly college GPA's												
	1	2	3	4	5	6	7	8	9	10	11	12	r_{12}
Math achievement													
High school	42	40	32	40	40	39	34	33	39	09	17	17	
College senior	34	36	26	28	38	35	35	36	37	08	16	15	84
Residual	-03	04	-03	-11	08	04	12	15	08	01	02	02	
Mechanical reas													
High school	29	36	22	25	25	19	20	27	29	03	-03	15	
College senior	26	32	18	21	19	16	12	22	25	01	-02	09	85
Residual	04	04	01	02	-02	02	-08	00	02	-02	01	-09	
Spatial ability													
High school	18	16	16	16	14	14	21	13	23	-10	11	19	
College senior	34	27	18	28	20	23	32	22	33	-07	14	19	74
Residual	32	22	10	24	15	19	24	20	24	01	10	07	

for the second year, .55 and .62; third year, .69 and .63. In the senior year, however, quarters 10 and 11 correlated .37, and 11 and 12, .48. The comparable values for Humphreys' semesters were .56 first year, .56 second year, .55 third year, and .54 for the fourth year. The senior year GPA's for this sample appear unreliable from quarter to quarter as well as being uncorrelated with all the aptitude/achievement scores.

Discussion

These results provide no evidence for the hypothesis that differing rates of aptitude maturation during college lie behind the lack of validity of precollege aptitude/achievement measures with later college grades. College senior test scores were no more highly correlated with later college grades than were test scores earned prior to college entrance.

Certainly the present sample matured intellectually during college both in terms of tested aptitudes (Lunneborg, in press) and in terms of grades (Table 1), even though the issue of scale of measurement in grades assigned freshmen vs. seniors cannot be definitely resolved. (Despite the rising average grade for this sample, the standard deviations of GPA's remained constant, as Humphreys also found.) But although the group as a whole grew on these aptitude/achievement measures, the long-term stability of the measures was high enough that the rank ordering of individuals as freshmen was as predictive of later college success as their rank ordering as college seniors.

The discrepancy between these results and Humphreys' lies primarily in the unreliability of the senior grades for this sample quarter to quarter compared with earlier grades which contrasts with Humphreys' near constancy

of adjacent semester correlations. With such low reliabilities the failure of senior grades to correlate with either precollege or senior test scores is not surprising. Second, the stability of validities over the first three college years for this battery, administered before and after college may be because this battery measures more "aptitude" than "achievement" in contrast with less stable predictors such as high school GPA's and ACT tests.

What these data suggest is that the substance of senior year college courses precludes easy global prediction for any segment of that period. On the other hand the similarity in content between precollege predictors and initial college course work may facilitate early prediction as does the fact that this initial course work is more common across a group than the highly disparate course selections made when college requirements have been met. Given that this "vicissitude" of the college experience may account for poor senior predictability, recommendations for admission and retention are not so easy to devise or recommend.

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